

AMENDMENTS TO THE CLAIMS

What is claimed is:

1. (Amended) A system for controlling and monitoring a reciprocal pump (110) producing hydrocarbons from a wellbore extending from the surface into the subterranean, the system comprising:

(A) a data gathering system to ~~monitor~~ generate a signal representative of a surface operating characteristic of the pumping system;

(B) a processor (130) in communication with the data gathering system, wherein the processor ~~comprises~~ includes software that when executed utilizes the signal representative of the operating characteristic to determine ~~the~~ a surface card, ~~determines to~~ determine ~~the~~ a downhole card, and ~~generates~~ to generate a graphics signal (131) representative of at least one card of the surface card ~~or~~ and the downhole card, and wherein the processor further comprises software that utilizes said at least one card for generating a pump control signal (132); and

(C) an output system (140) in communication with the processor, which upon receipt of the graphics signal from the processor provides a viewable graphical representation of ~~the graphics signal~~ said at least one card.

2. (Amended) The system of claim 1, wherein the pump control signal (132) is provided directly or indirectly to the pump for automatic control of the pump or provided to a human operator for ~~further processing~~ human control of the pump.

3. (Amended) The system of claim 1, wherein the graphics signal (131) generated by the processor is representative of both the surface card and the downhole card.

4. (Amended) The system of claim 3, wherein ~~the viewable graphical representation of the graphics signal comprises an axis on the surface card representing position having the same scale as an axis on the downhole card representing position~~ said

surface card and said downhole card are presented on common x-y axes representing rod (12) load and position.

5. (Amended) The system for controlling and monitoring of claim 4, wherein ~~in near real time comprises within 12 hours~~ said pump control signal is generated in real time within 12 hours of generating said signal representative of said surface operating characteristics.

6. (Amended) The system for controlling and monitoring of claim 4, wherein ~~in near real time comprises within 2 reciprocations of the pump~~ said pump control signal is generated in real time within two cycles of the pump after generating said signal representative of said surface operating characteristics.

7. (Amended) A method of monitoring a reciprocating pump (110) producing hydrocarbons from a wellbore extending from the surface into the subterranean, the method comprising the steps of:

(A) monitoring producing a signal representative of an operating characteristic of the well at the surface;

(B) generating at least one card of the surface card ~~or~~ and the downhole card utilizing the signal representative of said operating characteristic;

(C) ~~generating a pump control signal based on at least one of the surface card, downhole card or operating characteristic; and~~

(D) (C) providing displaying a viewable graphical representation of the ~~surface card or downhole card~~ said at least one card on an output system (140) which is permanently positioned in association with said pump (110).

8. (Amended) The method of claim 7, ~~wherein steps (C) and (d) occur in near real time, relative to step (A) of monitoring an operating characteristic~~ further comprising the step of

(D) generating a pump control signal in response to a characteristic of said at least one card.

9. (Amended) The method of claim 8, wherein ~~in near real time comprises within 24 hours~~ said steps (C) and (D) occur within twenty-four hours of said step (A) of monitoring said signal representative of an operating characteristic.

10. (Amended) The method of claim 8, wherein ~~in near real time comprises~~ said steps (C) and (D) occur within 10 reciprocations of the pump (110) after said step (A) of monitoring said signal representative of an operating characteristic.

11. (Amended) The method of claim 8, wherein ~~in near real time comprises~~ said steps (C) and (D) occur within 1 reciprocation of the pump (110) after said step (A) of monitoring said signal representative of an operating characteristic.

12. (Amended) The method of claim 7 8, further comprising the step of,

(E) providing the control signal directly or indirectly to the pump.

13. (Amended) The method of claim 7 12, in which step ~~(C) first comprises~~ (D) includes the step of comparing the surface or downhole card to ideal cards a shape of said downhole card to a shape of an ideal downhole card that is representative of an operating condition of the pump.

14. (Amended) The method of claim 13, further comprising:

(F) ~~repeatedly repeating~~ cyclically performing the steps (A), (B), (C), (D), and (E) while said pump is reciprocating.

15. (Amended) A system for controlling and monitoring a reciprocating pump producing hydrocarbons from a wellbore extending from the surface into the subterranean, the system of comprising,

a computer ~~receiving~~ arranged and designed to receive data regarding an operating characteristic of the pump, ~~and comprising the computer including~~ software that when executed instructs the system to:

112 (A) monitor ~~an~~ a signal representative of an operating characteristic of the well at the surface;

(B) generate at least one card of the surface card ~~or~~ and the downhole card utilizing the operating characteristic;

(C) generate a pump control signal based on a characteristic of said at least one of the surface card, downhole card or operating characteristic card.

(D) provide a viewable graphical representation of ~~the surface card or downhole card~~ said at least one card.

9 16. (Amended) The system of claim 15, wherein instructions (C) and (D) occur in near real time, relative to instruction (A) of monitoring said signal representative of an operating characteristic.

17. (Original) The system of claim 16, wherein near real time comprises within 24 hours.

18. (Original) The system of claim 16, wherein in near real time comprises within 10 reciprocations of the pump.

19. (Original) The system of claim 16, wherein in near real time comprises within 1 reciprocation of the pump.

20. (Amended) The system of claim 15, ~~further comprising wherein said~~ software that when executed further instructs the system to:

(E) provide the pump control signal directly or indirectly to the pump.

21. (Amended) The system of claim 15, in which instruction (C) ~~first comprises~~ generates said pump control signal by comparing the surface or downhole card to ideal cards

a shape of said downhole card to a shape of an ideal downhole card that is representative of an operating condition of the pump.

22. (Amended) The system of claim 21, ~~further comprising~~ where said software that when executed further instructs the system to:

(F) ~~repeatedly repeat~~ cyclically perform the steps (A), (B), (C), (D), and

(E).

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39. (Amended) A system for monitoring a reciprocating pump producing hydrocarbons from a wellbore extending from the surface into the subterranean, the system comprising:

(A) a data gathering system (120) to monitor a surface operating characteristic of the pumping system;

(B) a processor (130) in communication with the data gathering system, wherein the processor comprises software that when executed utilizes the operating characteristics to determine ~~the~~ a surface card, determines ~~the~~ a downhole card, and generates a graphics signal representative of at least one card of the surface card ~~or~~ and the downhole card; and

(C) an output system (140) in communication with the processor, which upon receipt of the graphics signal from the processor provides a viewable graphical representation of the graphics signal on a display screen on a regular basis as part of normal operations of the pump (110).

40. (Amended) A method of monitoring a reciprocating pump producing hydrocarbons from a wellbore extending from the surface into the subterranean, the method comprising the steps of:

(A) monitoring an operating characteristic of the well at the surface;

(B) generating a surface card utilizing the operating characteristics;

(C) generating a downhole card based upon said surface card; and

(D) generating a viewable graphical representation of both the surface card and the downhole card, wherein for the viewable graphical representation an axis on the surface card representing position is at the same scale as an axis on the downhole card representing position.

41. (Amended) The method of claim 5 40, wherein step (D) of generating a viewable graphical representation occurs in near real time, relative to step (A) of monitoring an operating characteristic.

42. (Amended) The method of claim 6 41, wherein the near real time comprises within 24 hours.

43. (Amended) The method of claim 6 41, wherein in near real time comprises within 10 reciprocations of the pump.

44. (Amended) The method of claim 6 41, wherein in near real time comprises within 1 reciprocation of the pump.

45. (Amended) The method of claim ~~4~~ 40, further comprising:

(E) adjusting the operation of the pump if warranted based on the surface card and the downhole card.

46. (Amended) The method of claim ~~40~~ 45, in which step (E) first comprises comparing the downhole card to ideal downhole cards.

47. (Amended) The method for monitoring of claim ~~40~~ 45, further comprising:

(F) ~~repeatedly~~ repeating ~~in sequence~~ steps (A), (B), (C), (D), and (E).

48. (Amended) A system for monitoring a reciprocating pump producing hydrocarbons from a wellbore extending from the surface into the subterranean, the system comprising

a computer receiving data regarding an operating characteristic of the pump, ~~and comprising the computer including~~ software that when executed instructs the system to:

(A) generate a surface card utilizing the operating characteristic;

(B) generate a downhole card based upon said operating characteristic; and

(C) generate a viewable graphical representation of both the surface card and the downhole card, wherein for the viewable graphical representation an axis ~~on~~ for the surface card representing position is at the same scale as an axis ~~on~~ for the downhole card representing position.

49. (Amended) The system of claim 13 48, wherein instruction (C) ~~of~~ to generate a viewable graphical representation occurs in near real time.

50. (Amended) The system of claim 14 48, wherein in near real time comprises within 4 hours.

51. (Amended) The system of claim 14 48, wherein in near real time comprises within 2 reciprocations of the pump.

52. (Amended) The system of claim 14 48, wherein in near real time comprises within 1 reciprocation of the pump.

112 ✓ 53. (Amended) The system of claim 13 40, ⁴⁸ ~~further comprising~~ wherein said software that when executed further instructs the system to:

(D) generate a control signal to adjust the operation of the pump if warranted based on ~~the surface card and the downhole card~~ a characteristic of at least one card of said surface card and said downhole card.

54. (Amended) The system of claim 18 53, in which ~~instruction (D) first comprises instructing~~ said software generates said control signal by the system to compare the downhole card to at least one ideal downhole cards card.

ON 55. (Amended) The system of claim 18 53 ~~further comprising~~ wherein said software that when executed further instructs the system to:

(E) ~~repeatedly~~ cyclically repeat ~~in sequence~~ said steps (A), (B), (C), and (D).

56. (Amended) A computer-readable storage medium having stored thereon a plurality of instructions for monitoring a reciprocating pump producing hydrocarbons from a wellbore extending from the surface into the subterranean, said instructions that when executed by a computer comprising instructions to the computer to:

(A) generate a surface card utilizing an operating characteristic of the pump;

(B) generate a downhole card based upon said surface card; and

(C) generate a viewable graphical representation of both the surface card and the downhole card, wherein for the viewable graphical representation an axis on the surface card representing position is at the same scale as an axis on the downhole card representing position.

57. (Amended) The medium of claim 21 56, wherein instruction (C) ~~of~~ to generate a viewable graphical representation occurs in near real time.

58. (Amended) The medium of claim 22 57, wherein in near real time ~~comprises~~ means within 2 reciprocations of the pump.

59. (Amended) The medium of claim 21 56, ~~further comprising~~ wherein said software ~~that when executed~~ further instructs the system to:

(D) generate a signal to adjust the operation of the pump if warranted based on the surface card and the downhole card.

60. (Amended) The medium of claim 24 59, in which the instruction (D) ~~first comprises instructing~~ causes the system to compare the downhole card to at least one of a plurality of ideal downhole cards.

61. (Amended) The medium of claim 24 59, the ~~further comprising~~ wherein said software further ~~that when executed~~ instructs the system to:

(D) ~~repeatedly~~ repeat in sequence steps (A), (B), (C), and (D).

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